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SECTION 5 SANITARY GRAVITY SEWERS

5.1 GENERAL

This section includes general technical criteria for the design and installation of sanitary gravity sewer systems.

5.2 DESIGN STANDARDS

The Developer shall comply with the applicable requirements specified within WEF Manual of Practice No. 9, Latest Edition, and the Recommended Standards for Wastewater Systems, Latest Edition, and as established by the Florida Department of Environmental Protection.

5.21 System Design

A) Average Daily Flow (ADF)

The sewer system design shall be based on full ultimate development as known, or projected. The average daily flow (ADF) from domestic units shall be calculated at the minimum rate of 250 gallons per day per equivalent residential unit, but should conditions be unfavorable such as high ground water conditions, an additional allowance shall be included for infiltration. Single family residences shall be computed at the rate of 3.5 persons per connection and multi-family or mobile home dwellings at 2.5 persons per unit. Flow requirements from commercial, industrial, institutional, or other special development areas shall be established from existing records or by estimated projections using the best available data; however, in no case shall a rate of less than 2,000 gallons per acre per day be used, unless specifically approved otherwise. It shall be stated in the Developers Agreement that sizing of the sewer system shall be the responsibility of the Developer, based upon his anticipated use of the land and flows generated therein. Any future upsizing of onsite improvements due to more intensive uses of the land shall be the responsibility of the Developer.

B) Maximum Daily Flow

Gravity sewers shall be designed on the basis of ultimate development maximum rates of flow. The maximum flow ranges from 2.0 to as a minimum up to a maximum of 4.0 times the cumulative ADF, depending on the number of houses contributing, as recommended by the Recommended Standards for Wastewater Facilities.

C) Sewer Size Computation

Sanitary sewers shall be sized to provide ample capacity for the maximum flow rates. The minimum allowable size for any sewer, other than service connections, shall be 8 inches in diameter. All sewers shall be designed at slopes providing a minimum velocity of not less than 2 feet per second when flowing full or half-full. Said computation shall be based on Manning's Formula using a roughness coefficient ("N") of not less than 0.013, unless justifiably approved otherwise. In general, the following minimum slopes shall be provided for sewer sizes to 24 inches:

MINIMUM SLOPE

SEWER SIZE (Feet per 100 feet)

8 inches 0.40

10 inches 0.28

12 inches 0.22

14 inches 0.17

15 inches 0.15

16 inches 0.14

18 inches 0.12

20 inches 0.11

21 inches 0.10

24 inches 0.08

Minimum slopes slightly less than those indicated may be considered in extreme situations; providing the depth of flow will not be less than 0.3 of the pipe diameter or the velocity less than 1.6 feet per second at design average daily flow, and justifiable reasons for the modification are presented to the City.

D) Design Considerations

- 1) Sewers 24 inches in diameter or less shall be installed with straight alignment and grade between manholes, with manhole spacing not to exceed 400 feet for sewers 15 inches or less, and 500 feet for sizes larger.
- 2) All sanitary sewers shall terminate at manholes.
- 3) All manholes and sewers shall be located in public Rights-of-Way. No manholes or sewers shall be located in side or back lot easements under any conditions.
- 4) Gravity sewer lines shall be required to be extended across the length of any newly developed property to provide continuation of service for future connections.
- 5) Any sanitary sewer easement provided on private property shall be required to have a minimum width of 15' and shall be dedicated to the City prior to City acceptance of the system.

5.22 Standard Requirements

A) General

The materials of construction and general installation procedures shall comply with

the Specific applicable standards set forth under Section 2, "Utility Excavation Trenching and Backfilling", Section 3, "Boring and Jacking" and Section 4, "Pipe, Fittings, Valves and Appurtenances".

5.23 Manholes

- A) Manholes shall be precast concrete. The minimum inside diameter of manholes shall be 48 inches for sewer sized to 21 inches in diameter or less, with submittal of special designs for larger pipes. Manholes are to be placed at the ends of jack and bore section for gravity sewer lines.
- B) Precast reinforced manholes shall be in accordance with ASTM Designation C478, with pre-formed flexible plastic joint sealer conforming to Federal Specification SS-S-0210 (GSA-FSS), "Ram-Nek", as manufactured by the K.T. Snyder Co., Inc., Houston, Texas or approved equal.
- C) Manholes are to be located in dedicated rights-of-way.
- D) Manhole frames and covers shall be gray cast iron conforming to ASTM Designation A48, Class 30, and shall have a minimum 22 1/4" opening. Covers shall have no perforations and shall be marked with the word "Sewer". Frames and covers shall be fully bedded in mortar to the correct finish grade elevation, with adjustment brick courses placed below, as detailed for precast manholes. There will be no steps allowed in manholes. See attached detail for further information.
- E) Manhole flow channels shall have smooth and carefully shaped bottoms, built up sides and benching constructed from concrete. Channels shall conform to the dimensions of the adjacent pipe and provide changes in size, grade and alignment evenly.
- F) The interior surfaces of all manholes shall be protected by the application of two (2) coats of Koppers Bitumastic No. 300M, or approved equal. Exterior surfaces shall receive two (2) coats of Koppers Bitumastic Black Solution or approved equal.
- G) Sewer clean-outs not in the pavement shall have around their tops in concrete pads, which will be flush with the top of the curb, with minimum dimensions of 18 by 18 by 3 inches. Sanitary sewer clean-outs shall be required at the property line, in accordance with the attached details.
- H) Manholes shall not be located in drainage swales or any other low area likely to collect or pond water during rains.
- I) A drop manhole connection shall be required for all inverts over 24" above the floor of the manhole, in accordance with the attached details.

5.24 Pipe Depth and Protection

The minimum allowable cover for gravity sewers shall be 3 feet from the top of the pipe to finish grade.

5.25 Pipe Bedding

Special care shall be exercised in the design and installation to provide adequate bedding for the type of pipe used, taking into consideration trench width and depth, superimposed

loadings above grade and the material below trench grade.

Pipe loadings capabilities shall be computed in accordance with established design criteria and special supporting bedding or facilities shall be provided as required.

5.26 Connections at Structures

Where sanitary sewers connect to structures, pipe joint bell shall not be installed at the wall face. Core bore into the existing manholes and use Kor-N-Seal flexible connectors or approved equal with stainless steel straps on all pipe to manhole connectors.

5.27 Transition Connections

Where pipes of alternate materials are to be connected between manholes, suitable approved transition couplings shall be installed.

5.28 Pipe Cutting

The cutting of pipe shall be performed by the proper tools and methods.

5.29 Service Connections

Installation shall be performed by the proper methods, including the wye branches installed in the sewer main at the point of connection, and the service pipe and required fittings extended to the property line or easement line, perpendicular to said line. The minimum service pipe size shall be 4 inches in diameter for single family residential connections and 6 inches in diameter for multi-family or commercial connections. On curbed streets, the exact location for each installed service shall be marked by etching or cutting as "S" in the concrete curb and painted green. Where no curb exists or is planned, locations shall be adequately marked by ½" steel rebar, 3" below final grade. A clean-out/plug is required to be installed on all connections at the right-of-way line.

5.30 Protection of Water Systems

The horizontal separation between sanitary sewers and existing or proposed water mains shall be in accordance with Chapter 62-555.314, F.A.C.

5.31 Grease Traps

Grease traps with a minimum size of 750 gallons shall be required on all connections with any food preparation, floor drains or wash basins (except residential connections). Grease traps and lines shall be separate from the sanitary flow. All grease traps shall have an accessible clean-out on the discharge side of the trap for sampling discharge. All grease traps shall be accessible for inspection and cleaning, and maintenance and cleaning shall be the responsibility of the utility customer. All grease traps shall comply with the requirements of the Florida Building Code, latest edition.

5.3 POLYVINYL CHLORIDE (PVC) SEWERS

A) GENERAL

This section includes the material and installation standards for pipe, fittings and appurtenances as applicable to PVC sanitary gravity sewer systems. The relevant provisions included in these specifications and standards shall be applicable to this Section, unless otherwise indicated herein or approved by the applicable Regulatory Agency.

B) MATERIALS

Polyvinyl Chloride (PVC) pipe and fittings for gravity sewage lines shall be manufactured from polyvinyl chloride resin conforming to ASTM Designation D1784. Pipe and fittings of this material shall conform to ASTM Designation D-3034 of F-949, STANDARD SPECIFICATION FOR TYPE PSM POLYVINYL CHLORIDE (PVC) SEWER PIPE AND FITTINGS. All pipe and fittings shall have a Standard Dimension Ratio (SDR) of not more than thirty-five (35) for sewers 13' deep, or less. For sewers installed at greater than 13' depth, a minimum of SDR 26 PVC pipe shall be used.

C) PIPE LENGTHS

PVC pipe for gravity sewers shall be furnished in a maximum of thirteen (13) feet lengths, with integrally formed bell joints.

D) JOINTS

PVC pipe and fittings for gravity sewers shall be furnished with joints conforming to ASTM D-3212, Standard Specification for Sewer Pipe Joints using Elastomeric Seals. All pipes shall have a factory installed rubber sealing ring. Field solvent weld fittings shall not be acceptable.

E) MANHOLE CONNECTIONS

All holes in manholes and/or wetwells shall be sealed utilizing a Kor-N-Seal boot.

F) SPECIAL BACKFILL

Where the soil in the excavated trench bottom is unsuitable (unstable), the contractor shall over excavate the trench bottom and backfill with crushed stone or gravel defined as Class I, except sizing shall be 1/4" to 3/4", under the U.S.C.S. Soil Classification System (FHA Bulletin No. 373), or crushed shell. In dry conditions, graded sands may be used.

H) PVC PIPE LAYING AND BACKFILLING

(1) Dewatering Required

Water shall not be allowed in the trenches while the pipe is laid. The use of a dewatering system is a requirement on any runs of pipe where such pipe will be below the ground water elevation at the specific Site. Sump and pump type trenching may be used only on short shallow runs where wellpoints would be impractical and excessively expensive, and only with the prior approval of the applicable Regulatory Agency. In all cases, density testing up to a point at least one (1) foot above the water table shall be completed prior to removal of dewatering equipment. On sewer lines installed using dewatering, service laterals shall be installed while the trench is dry.

(2) Pipe Alignment

Care must be taken to fit the joints together properly so that the centers of the pipes shall be in a straight line. All adjustments to line and grade must be made by scraping away or filling in under the barrel of the pipe and not by wedging or blocking up any portion of the pipe. In no case shall the pipe be walked on either before or after the joints have been made. Any pipe that has its grade alignment or

joints disturbed will be taken up and relaid. Pipe shall not be driven to grade by striking it with any unyielding object.

(3) Backfill and Deflection

Immediately after the pipe has been jointed and inspected, backfilling shall be placed to a minimum of twelve (12) inches above the crown of the pipe to adequately protect the pipe from injury and movement, in accordance with ASTM D2321. Before and during the backfilling of any trench, precaution should be taken against flotation of pipe lines therein due to entry of large quantities of water into the trench which could cause uplift of the pipe line. The diameter deflection of PVC pipe shall not exceed five (5) percent after completion and approval of construction, and for a period of one (1) year thereafter.

(4) Compaction

The mechanical compaction of backfill over sewer lines and appurtenances, within right-of-way and under all roadways, drives (including dirt drives), and parking areas shall be compacted to ninety-eight (98) percent of maximum density per AASHTO T-180. In unpaved areas outside of the right-of-way, the backfill shall be compacted to a minimum density of ninety-five (95) percent of maximum density.

5.4 TESTING

- A) The contractor shall perform testing of all sanitary gravity sewers, as set forth in these standards and shall conduct said tests in the presence of representatives from the City and/or other authorized agencies with 48 hours advance notice provided.
- B) Sanitary sewers to be tested shall be within sections. Testing shall not proceed until all facilities are in place and concrete cured. All piping shall be thoroughly cleaned prior to testing to clear the lines of all foreign matter.
- C) The contractor will utilize low-pressure air testing in accordance with Uni-Bell PVC Pipe Association, UNI-B-6-90, "Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe", latest revisions. Infiltration and exfiltration shall not exceed 300 gallons per day per inch of diameter per mile as measured between manholes. Testing shall proceed for a continuous period of two (2) hours, with infiltration amounts measured by methods approved by the Environmental Services Department.
- D) Should any test fail, necessary repairs shall be accomplished by the Contractor, and the test repeated until the established limits are satisfied. Any repairs shall be performed under the supervision of the City forces and by methods receiving prior approval by the City.
- E) If during final inspection the City has reason to doubt the integrity of the sewer lines due to infiltration or poor line alignment, the City may require internal inspection (televising) of the sewer lines at the expense of the developer.
- F) All sanitary gravity sewer lines shall be televised and lamped at the expense of the Owner/Contractor. In the event that the televising of the lines reveals problems (i.e. bellies, lateral deflection, etc), It may also be necessary, at the discretion of the City, to require an approved 9-arm deflection mandrel to be pulled through the sewer to ensure that the line is within acceptable slopes and deflection does not exceed 5% of the average inside diameter, as established by ASTM standards. Any pipe found to be out of compliance with these specifications, or not meeting the requirements of the City is to be removed and

replaced at the expense of the Owner/Contractor.

- G) As built plans will be furnished to the City upon completion of project with actual linear measurements from permanent points to all sewer systems components, including location of each house lateral.

(Reserved)